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Prime Item Development Specification for JTIDS Shipboard Antenna

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This specification establishes the performance, design, development, and test requirements for a Shipboard Antenna for use with the Joint Tactical Information Distribution System (JTIDS) Shipboard Class 2 Terminal.

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Part 1 of 1
8 March 1988

PRIME ITEM DEVELOPMENT SPECIFICATION

FOR

JTIDS SHIPBOARD ANTENNA

NAVAL OCEAN SYSTEMS CENTER

COMMAND AND CONTROL DEPARTMENT

COMMAND & CONTROL SYSTEMS INTEROPERABILITY DIVISION

SYSTEM INTEGRATION & EVALUATION BRANCH

SAN DIEGO, CALIFORNIA, 92152-5000

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1. SCOPE.

This specification establishes the performance, design, development and test requirements for a Shipboard Antenna hereafter referred to as the Antenna for use with the Joint Tactical Information Distribution System (JTIDS) Shipboard Class 2 Terminal, hereafter referred to as the terminal.

2. APPLICABLE DOCUMENTS.

2.1. Government documents.

The following documents, of the exact issue shown, form a part of this specification to the extent specified herein. In the event of conflict between the documents referenced herein and the contents of this specification, the conflict shall be resolved using the order of precedence of paragraph 3.8.

2.1.1. SPECIFICATIONS:

MIL-I-631	Rev. D, 15 November 1961; Amendment 5 - 20 June 1968 - Insulation, Electrical, Synthetic Resin Composition; Non-Rigid.
MIL-S-901	Rev. C, 15 January 1963; Amendment 1,5 September 1983 - *Shock Tests*, H.I. (High-Impact), Shipboard Machinery, Equipment and System; Requirements for Navy
MIL-T-5422	Rev. F, 30 November 1971 - Testing, Environmental, Airborne; General Specification for
MIL-P-15024	Rev. D, 18 Jul 1986 - Plate Tags and Bands for Identification of Equipment
MIL-E-16400	Rev. G, 24 December 1974 Amendment 1, December 1976 - Electronic, Interior Communications and Navigation Equipment, Naval Ship and Shore; General Spec for 1
MIL-N-18307	Rev. G, 15 August 1984; Amendment 2, 15 September 1986 - Nomenclature and Identification for Electronic, Aeronautical, and Aeronautical Support Equipment Including Ground Support Equipment Amendment 2 - 27 March 1975
MIL-A-55339	Rev. A, 20 July 1982 - General Specification for Adapters, Connectors, Coaxial, Radio Frequency (Between Series and Within Series)

MIL-I-81550	Rev. C, 14 July 1983 - Insulating Compound Electrical, Embedding, Reversion Resistant Silicone Department of Defense
DCB79S4000	Rev. C, 21 Mar 1983 with SCNs 1 through 8, as modified by ESD CCLN 007-3272 and ESD CCLN 007-3405 System Segment Specification for JTIDS Class 2 Terminal (U) (SECRET)
DCB86S5000	27 January 1988 - Addendum Specification for System Segment Specification for JTIDS Navy Shipboard Class 2 Terminal.
AS-4613	13 July 1976 - Applications and Derating Requirements for Electronic Components, General Specification for

2.1.2. **STANDARDS:**

DOD-STD-1399-070	26 February 1979-Interface Standard for Shipboard Systems Section 070, Part 1 dc Magnetic Field environment (Metric).
MIL-HDBK-217	Rev. E, 27 October 1986 - Reliability Prediction of Electronic Equipment.
MIL-STD-129	Rev. J, 25 September - 1984; Notice 1, 5 November 1986 - Marking for Shipment and Storage
MIL-STS-130	Rev. F, 21 May 1982; Notice 1, 2 July 1984; Notice 2, 1 May 1986 - Identification Marking for U.S. Military Property.
MIL-STD-167-1	1 May 1974 - Mechanical Vibrations of Shipboard Equipment (Type I - Environmental and Type II - Internally Excited)
MIL-STD-415	Rev. D, 1 October 1969; Notice 1, 8 October 1971 - Test Provisions for Electronic Systems and Associated Equipment, Design Criteria for
MIL-STD-454	Rev. K, 14 February 1986; Notice 1, 29 August 1986. Standard General Requirements for Electronic Equipment
MIL-STD-470	Rev. A, 3 January 1983 - Maintainability Program Requirements (for Systems and Equipments)
MIL-STD-471	Rev. A, 27 March 1973 - Notice 2, 8 December 1987 Maintainability Verification/Demonstration/Evaluation

MIL-STD-781	Rev. C, Change Notice 1, 20 March 1981 Reliability Design Qualification and Production Acceptance Tests; Exponential Distribution
MIL-STD-785	Rev. B, 15 September 1980 - Reliability program for Systems and equipment Development and Production.
MIL-STD-794	Rev. E, 16 July 1972 - Parts and Equipment, Procedures for Packaging and Packing of:
MIL-STD-810	Rev. D, 19 July 1983; Notice 1, 31 July 1986; Environmental Test Methods
MIL-STD-882	Rev. B, 30 March 1984; System Safety Program for Systems and Associated Subsystems and Equipment: Requirements for
MIL-STD-1472	Rev. C. 2 May 1981; Notice 1, 1 September 1983; Notice 2, 10 March 1984 - Human Engineering Design Criteria for Military Systems, Equipment and Facilities Notice 1, 10 May 1976
MIL-STD-1635	3 February 1978 Reliability Growth Testing

2.1.3. **DRAWINGS:**

NOSC TD 1283	Interface Control Drawing for JTIDS Shipboard JTIDS Antenna

2.1.4 **OTHER PUBLICATIONS:**

NAVPERS 18068	Section 1, Rev. D, September 1975; Section 2 Rev. D, January 1977 - Manual of Navy Enlisted Manpower and Personnel Classifications and Occupational Standards.
SPAWAR 0967-LP-627-3000 Series.	Change 3,4 September 1985; Technical Manual, Operation and Maintenance Instructions, Antenna Group OE-273(V)/URN and OE-273A(V)/URN
NOSC TBD #1	NOSC JTIDS Project Management Plan for WBS 3.4 - Shipboard Antenna Development.
NOSC TBD #2	Logistics Program Plan for JTIDS Shipboard Antenna

3. REQUIREMENTS.

3.1. Item Definition.

The Antenna is a Circular Aperture Bicone array with an attached Power Combiner/Divider containing 12 RF ports. The array is composed of two cones, placed apex-to-apex to form the RF wavefront, and 12 antenna probes. This provides for transmission and reception of the JTIDS RF signals over 360° of azimuth coverage with a tapered hemispheric elevation coverage. The Antenna shall operate over the entire JTIDS frequency band (960 MHz to 1215 MHz) without electrical or mechanical tuning.

The Antenna is a mast mounted structure located beneath the OE-273(V)/URN Tactical Air Navigation (TACAN) Antenna Group, and provides both the mechanical support and the electrical connections required for the AS-3240/URN TACAN Antenna.

3.1.1. Item Diagram.

The functional relationship of the major components of the Antenna are shown in Figure 3.1.

3.1.2. Interface Definition.

The Antenna shall provide and accept the electrical interfaces specified in Interface Control Drawing NOSC TD 1283, which includes the TACAN and the JTIDS Antenna Interfaces.

3.1.3. Major Component List.

The major components of the JTIDS Shipboard Antenna are:

a. Bicone Array Assembly containing 12 probes

b. 12-way Power Divider/Combiner

c. Transmission/Signal Cabling for TACAN

d. Antenna Housing (Mast Extender & Power Divider Housing)

e. Radome Enclosure

3.1.4. Government Furnished Property List.

Not applicable to this specification.

3.1.5. Government Loaned Property List.

Not applicable to this specification.

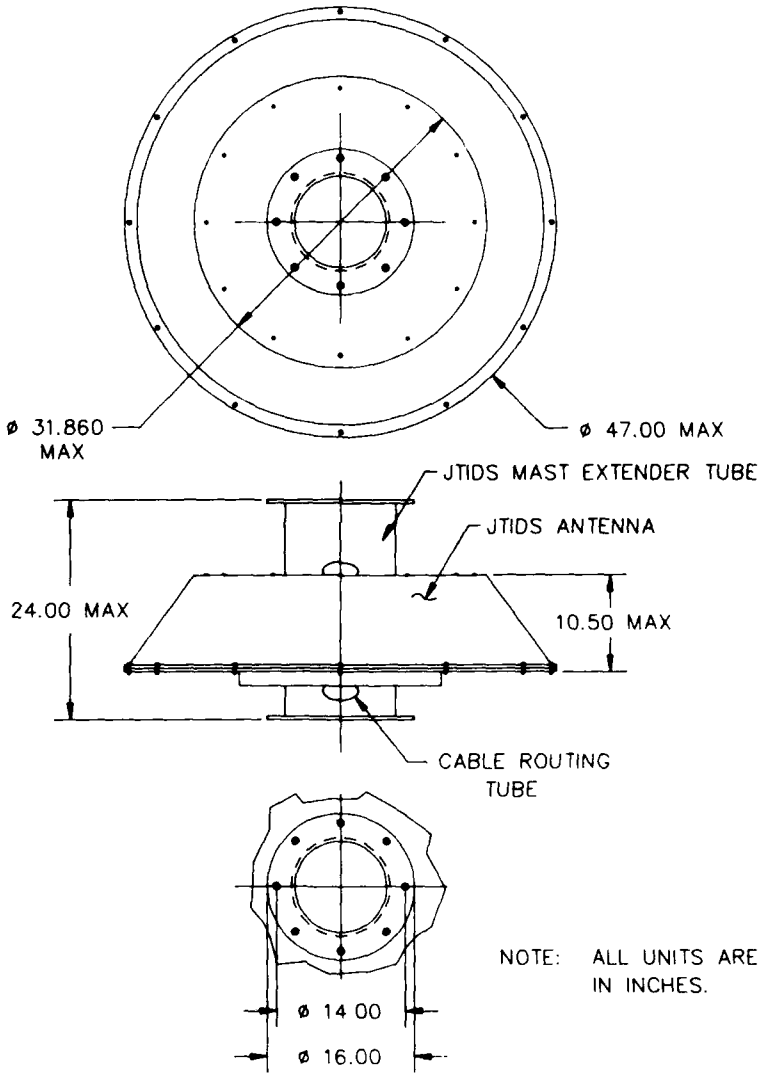

Figure 3.1 - JTIDS Shipboard Antenna Major Components (Sheet 1 of 2)

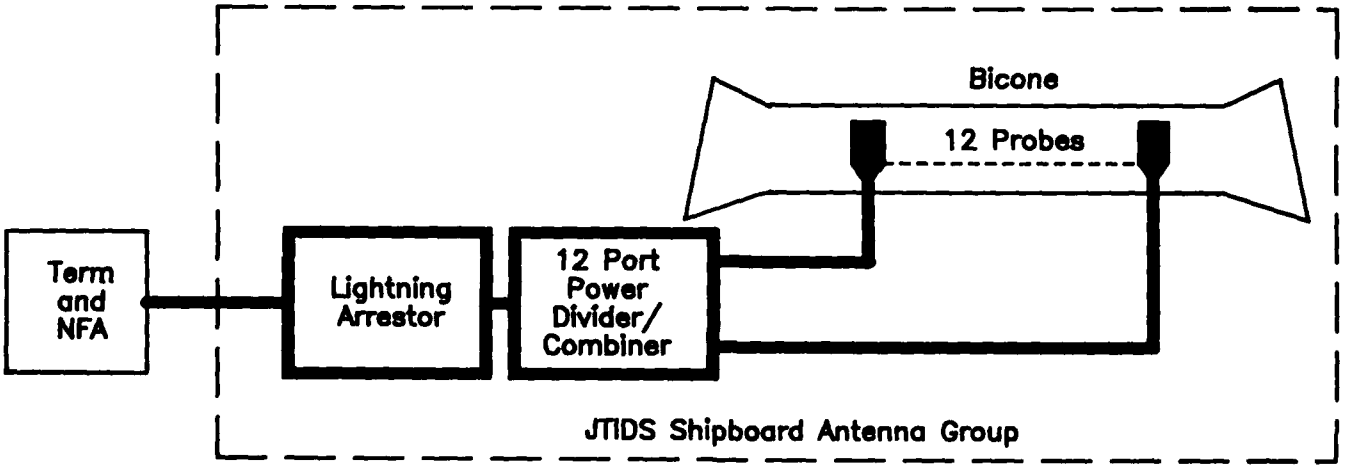

Figure 3.1 - JTIDS Shipboard Antenna Major Components (Sheet 2 of 2)

3.2. **Characteristics.**

3.2.1. **Performance Characteristics.**

3.2.1.1. **Frequency Range.**

The Antenna shall satisfy all requirements specified herein for the full frequency content of the transmitted and received JTIDS signals at any frequency within the 960 MHz to 1215 MHz range.

3.2.1.2. **Polarization.**

The electromagnetic energy radiated by the Bicone Array shall be vertically polarized.

3.2.1.3. **Radiation Pattern and Gain.**

The radiation pattern of the Antenna, installed below the AS-3240/URN TACAN Antenna. Shall be azimuthally omnidirectional with amplitude variations not exceeding 1.5 dB peak-to-peak. The main lobe of the Antenna shall have a minimum gain of 2.0 dBi. The elevation pattern of the main lobe of the Antenna, as measured between its 3.0 dB points shall provide at least 50 degrees of elevation coverage. The elevation pattern shall be tilted upward to put the horizon at approximately 1.5 dB below the beam peak on the lower portion of the main lobe.

3.2.1.4. **Overhead Coverage.**

Radiation pattern coverage shall extend toward the zenith to fill in the inherent cone-of-silence of the Bicone Array. The resulting overhead coverage of the Antenna, installed below the AS-3240/URN TACAN Antenna in accordance with Interface Control Drawing NOSC TD 1283, shall not be less than 16 dB below the amplitude of the beam peak of the main lobe. A 3 degree Cone-of-Silence, due to physical effects, shall be permitted in the zenith direction. The overhead coverage shall not degrade the radiation pattern and gain requirements of paragraph 3.2.1.3.

3.2.1.5. **Ports.**

The Antenna shall have a coaxial RF port (coaxial connector) associated with the Bicone Array. The location of the port is shown in figure 3.3. The port shall be capable of handling the RF power requirements specified in paragraph 3.2.1.9.

3.2.1.6. **Characteristic Impedance.**

The input impedance of the Antenna measured at the Coaxial RF Port over the frequency range of 960 MHz to 1215 MHz shall be nominally 50 ohms.

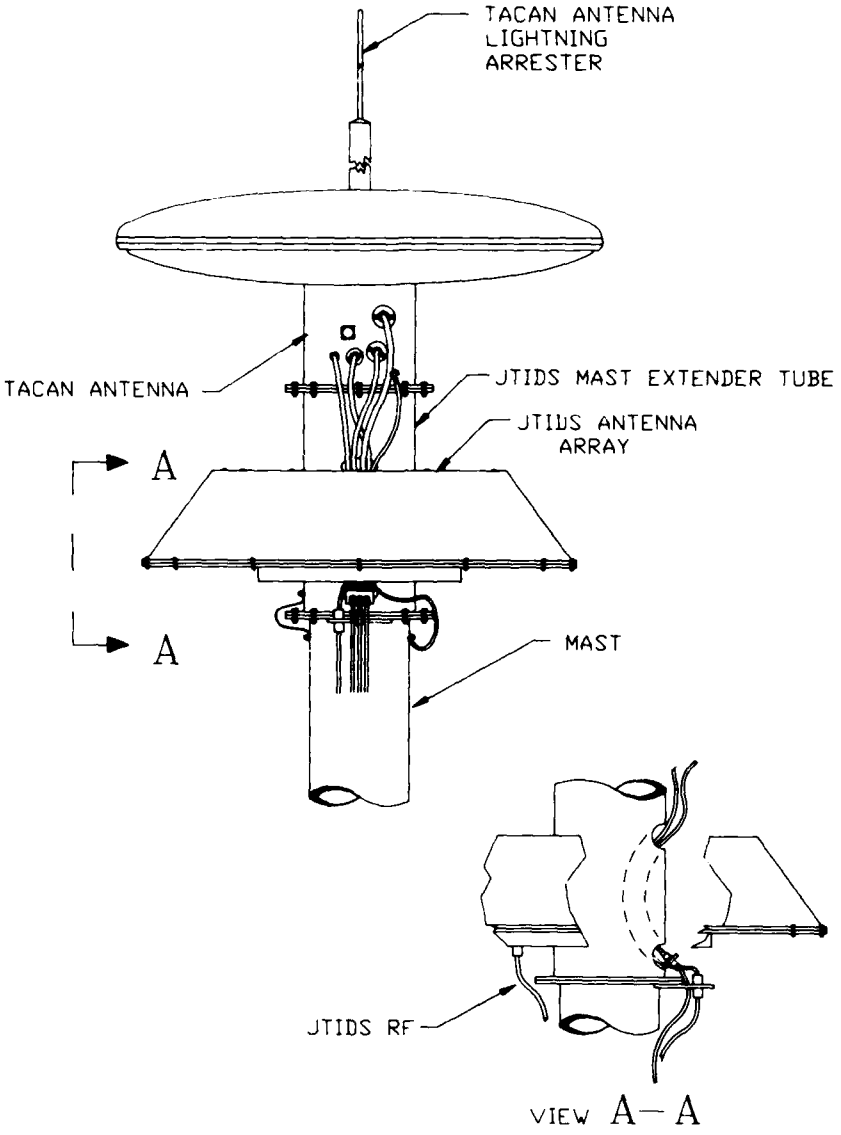

Figure 3.2 - JTIDS Shipboard Antenna Line of Sight Requirements

3.2.1.7. **Voltage Standing Wave Ratio (VSWR).**

The input VSWR measured at the Coaxial RF Port of the Antenna, shall not exceed 1.5:1.

3.2.1.8. **Isolation.**

The isolation between the Antenna and the AS-3240/URN TACAN Antenna shall be greater than 40.0 dB for all frequencies between 960 MHz and 1215 MHz. With the exception of the insertion loss specified in paragraph 3.7.3 associated with the Transmission/Signal Cabling for TACAN, there shall be no degradation to the performance of the OE-273(V)/URN TACAN Antenna Group due to the installation of the Antenna in accordance with Interface Control Drawing NOSC TD 1283.

3.2.1.9. **RF Power Capability.**

The Antenna shall operate as specified under any combination of environmental conditions specified herein with a peak power of 1200 watts and an average power of 140 watts supplied to the Coaxial RF Port.

3.2.1.10. **Corona.**

There shall be no corona or evidence of corona when operated under the RF power requirements of paragraph 3.2.1.9.

3.2.1.11. **Intermodulation Products.**

Any intermodulation products, resulting from primary signals within the 960 to 1215 MHz frequency band that are radiated from the Antenna, shall be a minimum of 63 dB below the level of primary signals.

3.2.1.12. **Lightning Protection.**

The Antenna shall be provided with an appropriate lightning arrester to prevent damage to the 12 port power divider.

3.2.1.13. **Insersion Loss.**

The insersion loss of the Antenna shall not be greater than 2.2 db.

3.2.2. **Physical Characteristics.**

The Antenna shall be a stand alone structure, mounted on a ship's mast, supporting the AS-3240/URN TACAN Antenna. The physical relationships between the Antenna and the AS-3240/URN TACAN Antenna are outlined in Figure 3.3. The specific dimensional relationships are specified in Interface Control Drawing NOSC TD 1283. The Antenna shall be a modular design comprised of a Bicone assembly, power divider/combiner and interconnecting cables. The Antenna shall provide the required connectors and feedthrough cabling for the AS-32400/URN TACAN Antenna Group.

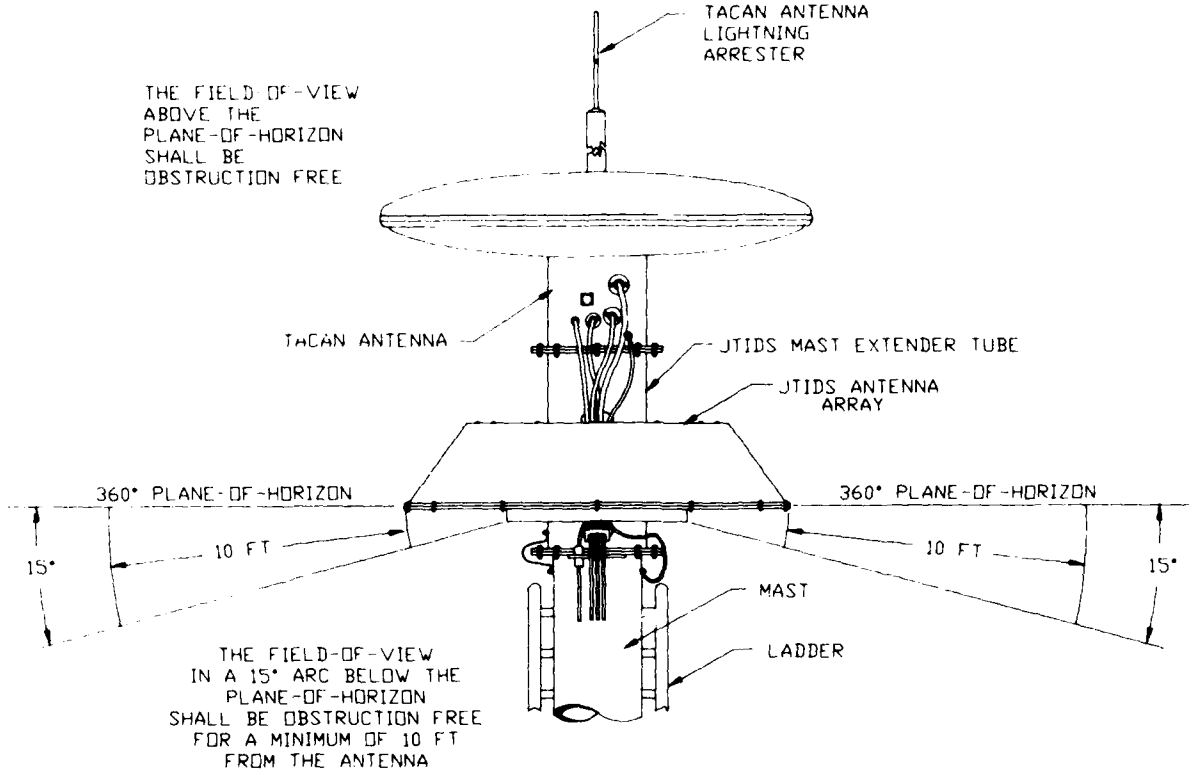

Figure 3.3 - JTIDS Shipboard Antenna Typical Installation

3.2.2.1. **Paint.**

The exterior of the Antenna, except for the antenna radome, shall be finished in accordance with MIL-E-16400.

3.2.2.2. **Mounting.**

The Antenna shall have flat horizontal mounting flanges for through-bolt mounting to the mast and to the AS-3240/URN Antenna. The Antenna shall provide mechanical support and cabling for the overhead AS-3240/URN TACAN Antenna as specified in Chapter 8, Installation for OE-273(V)/URN Antenna Group, SPAWAR 0967-LP-627-3000 Series. The horizontal mounting flanges shall be 16 inches in overall diameter with eight (8) equally spaced mounting holes 11/16 inch diameter on a 14.00 inch bolt circle. The eight (8) hole pattern shall have two (2) opposite holes aligned with the North-South (Bow-Stern) plane of antenna and be drilled to an accuracy of +/- 0.50 degrees relative to the North-South plane of the Antenna in accordance with SPAWAR 0967-LP-627-3000 Series.

3.2.2.3. **Size**

The antenna assembly shall be a circular structure not exceeding 47.0 inches in diameter and 24.0 inches in height. The specific dimensions are as specified in Interface Control Drawing NOSC TD 1283.

3.2.2.4. **Weight.**

The weight of the antenna shall not exceed 100 pounds.

3.2.2.5. **Pressure Relief.**

Both the Radome/Bicone assembly and the Power Divider/Mast Extension Housing shall be provided with a pressure relief system. The system shall vent to the atmosphere when the pressure exceeds 5 psi. The operation of the pressure relief vent shall not reduce the pressure below 4 psi.

3.2.2.6. **Sealing.**

The Antenna shall be provided with appropriate seales for both the Radome/Bicone and Power Divider Mast Extension assemblies these. These Series shall be capable of withstanding a minimum pressure of 10 psi.

3.2.3. **Reliability.**

The specified Mean-Time-Between-Failures (MTBF) as defined by MIL-STD-781, of the Antenna shall be no less than 250,000 hours.

3.2.4. **Maintainability.**

The maintainability program requirements for the Antenna shall be in accordance with MIL-STD-470, and as specified herein. The maintenance concept at the organizational level is by antenna replacement. At the depot level, the antenna shall have a Mean-Corrective-Maintenance-Time (M_{mct}) of 90 minutes

and a Maximum-Corrective-Maintenance-Time(M) of 150 minutes at the 95th percentile of all corrective maintenance actions performed. These requirements are based on the utilization of a single electronic technician, skill level ET-3 as defined in NAVPERS 18068.

The MCT includes the time to accomplish the following actions:

a. Verify fault;

b. Locate fault;

c. Remove and replace faulty element;

d. Checkout of the repair;

e. Reinitialization;

f. Verification of antenna VSWR.

3.2.5. **Environmental Conditions.**

The antenna shall be designed to meet all performance requirements when subjected to any individual or probable combination of service or induced environmental conditions specified herein. The equipment shall operate within all performance requirements throughout the tests specified without alignment or adjustment.

3.2.5.1. **Service Conditions.**

The antenna shall be designed such that no electrical or mechanical damage or performance degradation occurs during operation or after storage in the following ambient conditions:

a. **Equipment Exposed to Weather (Unsheltered):** The antenna, or portions thereof, exposed to the weather (unsheltered) shall maintain specified performance when exposed to the high and low operating temperatures obtained from MIL-E-16400, shown below:

Exposed-unsheltered	Operating	Non-operating
	$-28^{o}C$ to $+65^{o}C$	$-62^{o}C$ to $+71^{o}C$

b. **Equipment Utilized in Sheltered Area:** Not Applicable.

c. **Non-operating Temperature Ranges:** The antenna shall not be damaged nor shall operational performance be degraded when restored to the operating temperature range after being subjected to the non-operating range.

d. **Humidity, and water:** The antenna shall maintain the specified performance when exposed to a relative humidity of 95 percent for both continuous and intermittent periods, including conditions wherein condensation takes place in and on the equipment in the form of both water and frost. The Antenna

shall be watertight in accordance with paragraph 3.7.2.1 of MIL-E-16400.

e. **Fungus:** The antenna shall withstand, in both an operating and non-operating condition, exposure to fungus growth as specified in MIL-STD-810, Method 508.I. In no case shall overall spraying of the antenna be necessary to meet this requirement.

f. **Salt Atmosphere:** The antenna or portions thereof, exposed to the weather shall maintain the specified performance after completion of the salt fog test of Procedure I, Method 509.2 of MIL-STD-810. The complete equipment or portions thereof, as specified, shall be capable of withstanding the effects of the salt fog test specified herein. After completion of the test and cleaning, the base metal of the part or structure shall not be visible through the finish or coating, nor shall there be any evidence of blistering, softening, separation from the base metal, corrosion products, or other coating failure.

g. **Wind Velocity:** The antenna portions thereof, exposed to the weather shall operate normally in winds having a relative velocity of 75 knots, and shall be capable of withstanding, without damage, winds having a relative velocity as great as 100 knots.

h. **Icing:** The antenna or portions thereof, exposed to the weather shall be capable of withstanding an ice load of 4.5 pounds per square foot of exposed surface without structural damage.

i. **Pressurization:** The antenna shall not employ pressurized assemblies.

j. **Solar Radiation:** The antenna shall maintain performance after being subjected to the sunshine test specified in paragraph 3.3.5.5 of MIL-E-16400.

k. **Lightning:** As protection against lightning strike, the Antenna shall withstand a transient of 700 volts, 10 microseconds in duration applied to the RF input of the Antenna.

l. **Inclination:** The antenna shall be capable of withstanding the inclination test specified in paragraph 4.8.3.16 of MIL-E-16400 inclination angle shall be 45 degrees.

m. **Magnetic Field Environment:** The Antenna shall be compatible with the Magnetic Field Environment of DOD-STD-1399, Section 070-Part 1.

3.2.5.2. **Induced Environmental Conditions.**

The antenna shall meet all operating performance requirements in the vibration and shock environments specified herein and shall also be operable, without degradation of performance, after exposure to the non-operating vibration and shock environments of shipment specified herein.

3.2.5.2.1. **Vibration.**

3.2.5.2.1.1. **Operating Vibration.**

The antenna shall be capable of withstanding the Type I vibration test of MIL-STD-167-1, with the exception that the maximum vibration frequency shall be limited to 29 Hz. The antenna shall be capable of withstanding the vibration requirements for mast-mounted equipment as specified in MIL-STD-167-1. The operational vibration requirements shall be met with a mechanical equivalent of the AS-3240/URN Antenna in place.

3.2.5.2.1.2. **Non-Operating Vibration.**

When packaged for shipment, the antenna shall withstand exposure to the following vibration in any axis, without consequent damage or degradation of performance:

Table 3.1 Non-Operating Sinusoidal Vibration

Frequency	Amplitude
5 to 27 Hz	±/-1.3g peak
27 to 51 Hz	0.036 inches Double Amplitude
52 to 500 Hz	± 5g peak

3.2.5.2.2. **Shock.**

3.2.5.2.2.1. **Operational Shock.**

The Antenna shall be capable of withstanding the Grade A, Type A, Class I shock test as specified in MIL-S-901. The Antenna or portions thereof, which may be directly exposed to gunblast shall be capable of withstanding a peak shock and air blast pressure front of 9.5 pounds per square inch (gauge). The operational shock requirements shall be met with a mechanical equivalent of the AS-3240/URN Antenna in place.

3.2.5.2.2.2. **Transportation Shock.**

The Antenna shall suffer no damage when subject to the drop test of MIL-T-810, Method 516.3, Procedure IV.

3.2.6. **Transportability.**

After preparation for delivery as required by Section 5, the Antenna shall be capable of transportation by air, rail, ship or surface carriers without damage.

3.2.7. **Nuclear Control Requirements.**

The Antenna shall meet the EMP Survivability requirements of Appendix VI of DCB 86S5000.

3.3. **Design and Construction.**

Except as modified herein, the design and construction of the Antenna shall conform to the general requirements of MIL-E-16400.

3.3.1. **Materials, Processes and Parts.**

Parts, materials and processes used in the Antenna shall be as specified in MIL-E-16400, MIL-STD-454, and the following paragraphs.

3.3.1.1. **Parts.**

All parts shall be selected in accordance with Paragraph 3.4 of MIL-E-16400. All resistors shall be screened on a vector analyzer.

3.3.1.1.1. **Electrical Connectors.**

Only Environmentally sealed connectors shall be used for external electrical interconnection with shipboard equipment. RF coaxial connectors shall be in accordance with MIL-C-39012, Series N and TNC, except where the power or voltage rating of these series do not meet application requirements. In these cases, Series HN in accordance with MIL-C-3643 shall be used.

Connectors internal to the Antenna shall conform to MIL-C-38999 Series III for General Duty.

3.3.1.2. **Materials.**

3.3.1.2.1. **Moisture and Fungus Resistance.**

The antenna shall be designed with materials that are moisture resistant and are not nutrients to fungi. The use of nutrient material is acceptable in the assemblies which are hermetically sealed. Fungus inert materials are identified in MIL-STD-454, Requirement 4. Other materials shall be certified fungus-resistant or shall be tested per Method 3, MIL-STD-810.

Absorption, retention or release of moisture by a part shall not degrade or affect the performance of the antenna.

3.3.1.2.2. **Corrosion.**

Corrosion prevention and control as an overall concept shall be emphasized during design and fabrication of the antenna. The antenna not corrode such that the corrosion would adversely affect its functions during the specified service life consistent with required reliability and maintenance concepts. Requirement 16 of MIL-STD-454 shall apply.

3.3.1.3. **Design Practices.**

3.3.1.3.1. **Reliability Design Requirements.**

The antenna shall be designed such that failure of one component shall not result in failure of other components.

3.3.1.3.1.1. **Reliability Program.**

The reliability program shall be in accordance with the reliability section of Logistics Program Plan, NOSC TD TBD #2. The reliability Program shall be in accordance with MIL-STD-785 tasks 1.1, 1.4, 2.3, 2.4, 3.1, 3.2.

3.3.1.3.1.2. **Reliability Predictions.**

The reliability predictions shall be in accordance with part stress data and methods, MIL-HDBK-217 and shall be based on shipboard application.

3.3.1.3.1.3. **Development Testing.**

MIL-STD-1635 shall be used as a guide in development testing.

3.3.1.3.1.4. **Detailed Reliability Design Practices.**

The following reliability design practices shall apply:

a. Use of electrical connectors requiring potting compound material shall be avoided.

b. Materials used for encapsulation and embedment shall be selected for their operational environment conditions. Only those materials which meet or exceed the requirements of MIL-I-81550 shall be used.

c. Derating criteria shall be in accordance with AS-4613, Class B

d. Parts/circuits shall be representative of a general class available from more than one source.

3.3.1.3.2. **Maintainability Design Requirements.**

The Antenna design and construction shall be such that it can be maintained within specified maintainability time constraints. The following service and access requirements shall apply:

a. The Antenna design shall be in accordance with MIL-STD-415 and paragraph 5.9 of MIL-STD-1472.

b. The design shall make full use of sealed and life warranted components.

c. The design shall provide means for complete removal of major components or modules from their enclosures. The design shall not employ hard wiring between modules.

d. Modules shall be designed to permit maximum ease of replacement and test accessibility.

e. The variety and number of tools and test equipment required to maintain the equipment shall be held to a minimum.

f. Alignment, calibration and preventive maintenance shall not be required.

3.3.2. **Electromagnetic Interference (EMI)/TEMPEST.**

Not applicable, except for the isolation requirement of 3.2.1.8.

3.3.3. **Nameplates and Product Marking.**

3.3.3.1. **General.**

Identification and marking shall be in accordance with MIL-STD-130 and MIL-N-18307. Nameplates and markings shall not degrade performance of the Antenna.

3.3.3.2. **Detail Requirements.**

3.3.3.2.1. **Nameplate.**

One nameplate for the Antenna shall be provided. The nameplate shall be in conformance with MIL-STD-130 and MIL-N-18307.

3.3.3.2.2. **Location.**

The nameplate shall be located on the Antenna primary structure, i c., not on removable parts or covers.

3.3.3.2.3. **Attachment.**

The nameplate may be attached on the Antenna by either rivets or screws. Aluminum foil nameplates shall be attached by adhesive bonding. Adhesive backed identification plates Type G of MIL-P-15024 shall not be used.

3.3.3.2.4. **Size.**

The nameplate size shall be commensurate with the Antenna size and the information required. Letters, numerals, type and legibility of same, shall be in accordance with MIL-STD-130 and MIL-N-18307. The approved nomenclature (item name and type designator) shall be emphasized by the use of large characters. When the Antenna size limits the nameplate size, the nameplate shall include as a minimum, the part number, serial number and design activity code.

3.3.3.2.5. **Part Markings.**

Identification of item subassemblies and components that do not require nameplates shall be accomplished in accordance with MIL-STD-130, and MIL-N-18307.

3.3.3.2.6. **Conductor Identification.**

Conductor identification shall be in accordance with Requirement 20 of MIL-STD-454.

3.3.3.2.7. **Terminal End Identification.**

Markings shall be made on white synthetic resin tubing conforming to Type F, Grade A, Form U., Class I of MIL-I-631; or on polyvinyl chloride pressure-sensitive adhesive marking tape. All wire marking shall be clearly visible in the assembled Antenna. The tape markers shall be tightly wrapped with at least two turns around the wire.

3.3.3.2.8. **Weight, Dimension, and Center of Gravity Data.**

The antenna shall be provided with a data plate as necessary to specify at least the weight.

3.3.4. **Workmanship.**

Workmanship shall be in accordance with Requirement 9 of MIL-STD-454.

3.3.5. **Interchangeability.**

Mechanical and electrical interchangeability in accordance with Requirement 7 of MIL-STD-454 shall exist between like assemblies, subassemblies and replaceable parts regardless of manufacturer or supplier.

3.3.6. **Safety.**

The design of the Antenna shall contain safety features in accordance with Requirement 1 of MIL-STD-454 and the following paragraphs.

3.3.6.1. **System Safety Program.**

The NOSC shall develop and maintain an effective safety program that is planned and integrated into all phases of design, production, and testing of the Antenna. The system safety program shall provide a disciplined approach to identify hazards and prescribe corrective actions in a timely, cost-effective manner. The system safety program tasks shall be specified in the Systems Safety Sections of the Logistics Program Plan (NOSC TD TBD #2).

MIL-STD-882 shall be used as guidance for preparing and implementing the System Safety Sections.

3.3.6.2. **Safety Criteria.**

Safety criteria shall be applied during Antenna hardware design, selection, and construction to eliminate hazards that could cause injury to operating and maintenance personnel.

Hazards such as sharp corners, projections, or moving parts that could cause injury directly or indirectly by catching onto clothing shall be eliminated, minimized by design effort, or covered with protective shields or guards.

3.3.6.3. **Personnel Hazards.**

Safety (personnel hazard) shall conform to Requirement 1 of MIL-STD-454 and as specified herein.

3.3.7. **Human Performance/Human Engineering.**

The design of operator and maintenance interface shall be in accordance with the applicable sections of MIL-STD-1472. The radome shall be marked appropriately to minimize damage when the TACAN Antenna is being serviced.

3.4. **Documentation.**

All documentation shall comply with the NOSC JTIDS Project Management Plan for WBS 3.4 - Shipboard Antenna Development (NOSC TBD #1).

3.5. **Logistics.**

3.5.1. **Maintenance.**

3.5.1.1. **Concept.**

The Antenna shall be designed to permit three levels of maintenance: Organizational, Intermediate, and Depot in accordance with OPNAVINST 4790.2B and OPNAVINST 4700.7F.

3.5.1.1.1. **Organizational Maintenance.**

Organizational Level Maintenance (O Level) will consist of utilizing the JTIDS Class 2 Terminal's Built-In-Test (BIT) authorized support equipment (SE), and approved technical manuals to fault/detect/verify/isolate the Antenna to the antenna or its associated cabling. In addition O Level will perform a corrosion inspection on the antenna semi-annually.

3.5.1.1.2. **Intermediate Maintenance.**

Intermediate Level Maintenance (I Level) will consist of removal and installation, verification of faults, and repair of the Antenna and the antenna cable. I Level will be accomplished utilizing authorized SE, BIT, and approved technical manuals. The repair responsibility of the I Level will be determined by review of, the level of repair analysis (LORA).

3.5.1.1.3. **Depot Maintenance.**

Depot Level Maintenance (D Level) will consist of verifying faults identified at I Level and Beyond their Capability of Maintenance (BCM). D Level will fault isolate to the failured item, remove and replace the item, and certify the antenna as Ready For Issue (RFI).

3.5.1.2. **Maintenance Task Descriptions.**

O Level - Maintenance at the O level will consist of the following tasks:

a) fault verification
b) fault isolation

I Level - Maintenance at the I Level will consist of the following tasks:

a) fault verification
b) fault isolation
c) removal/installation of antenna and its associated cabling
d) removing and replacing faulty components
e) certify antenna as RFI

D Level - Maintenance at the D level will consist of the following tasks:

a) fault verification
b) fault isolation
c) remove/replace faulty components
d) manufacture items
e) certify antenna as RFI

3.5.1.3. **Technical Data.**

NOSC shall provide the technical data to develop the following:

a) installation and removal procedures
b) fault isolation procedures
c) remove and replace procedures
d) repair verification procedures

The technical data provided shall be based on and traceable to the Failure Mode Effects, and Critically Analysis (FMECA), corrective/preventive maintenance analysis, task and skill analysis and LORA decisions reflected in the maintenance plan.

3.5.2. **Supply.**

In the design of the Antenna, National Stock Number (NSN) items as listed in Defense Logistics Supply Center (DLSC) parts list shall be used to the maximum extent possible. In addition, the JTIDS Shipboard Antenna shall be designed to be maintained and repaired using NSN items and test equipment where appropriate.

3.5.3. **Facilities and Facility Equipment.**

The Antenna shall require no new facilities or facility equipment.

3.5.4. **Support Equipment (SE).**

The Antenna shall not require Peculiar SE. The need for special tools shall be kept to a minimum. If required, special tools shall be supplied in accordance with MIL-STD-454, Requirement 63 and shall meet the storage and operating environment conditions specified for the Antenna.

3.6. **Personnel and Training.**

3.6.1. **Personnel.**

Operation and maintenance of the antenna shall be automated to the maximum extent commensurate with the state-of-the-art in electronic technology. Those operational diagnostics and repair functions which cannot be performed electronically shall be designed to require the minimum man/machine interface.

3.6.1.1. **Operation.**

Not applicable.

3.6.1.2. **Maintenance.**

The maintainability requirements shall be based on the capabilities (skill level and experience) of a Navy Electronics Technician, third class (ET-3) as defined by NAVPERS 18068.

3.6.2. **Training.**

The Antenna shall be designed to require no operator or maintenance training beyond On-the-Job Training provided by shipboard personnel experienced in communication or navigation systems utilizing system operation and technical manuals.

3.7. **Major Component Characteristics.**

Figure 3.1 provides the view of the major components and their orientation and physical configuration.

3.7.1. **Bicone Array Assembly Containing 12 Probes.**

The Bicone Array Assembly shall be fabricated from a lightweight metalized fiberglass material that shall provide an opaque/reflective surface to the JTIDS's RF and support a circular array of 12 antenna probes. This bicone array assembly shall consist of two conical structures connected at their apexes by an extension of the supporting mast of appropriate length. The configuration of the conical structures shall be such as to shape the radiated RF energy with the proper elevation plane characteristics. The lower conical structure that forms the RF energy shall not exceed 43 inches in diameter. The RF energy radiated in the azimuth plane shall be omnidirectional and shall be generated by 12 equally spaced probes of proper shape and location, so as to transfer the RF energy with minimum loss. The probes shall be connected to the 12-way Power Divider/Combiner by equal length cables of minimum length.

3.7.2. **12-way Power Divider/Combiner.**

The 12-way Power Divider/Combiner shall provide for proper isolation of the antenna probes and impedance matching for the JTIDS Terminal Transmitter and Receiver assemblies. The power divider/combiner consists of stripline Printed Wiring Board (PWB) high power isolation resistors, and integral heat sink. The power divider/combiner shall be located underneath the antenna assembly and physically affixed to the mast to provide for mechanical support and thermal conduction. A bulkhead connector adapter type MIL-A-55339 will be provided to mechanically isolate the input of the divider from the JTIDS transmission/receive cable. All tests made on the power divider/combiner shall be made with all unused ports loaded with 50 ohm terminations providing a VSWR of less than 1.25:1. The input/output VSWR shall be less than 1.5:1. The insertion loss shall be less than 0.7 dB. The isolation between output ports shall be greater than 8.0 dB.

3.7.3. **Transmission/Signal Cabling for TACAN.**

The Transmission/Signal Cabling for TACAN includes the cabling required to interconnect the TACAN connectors at the base of the Antenna to the equivalent connectors on the TACAN Antenna. The maximum insertion loss to the TACAN receive or transmit signals as a result of the installation of the Antenna shall be less than 0.5 dB. The Transmission/Signal Cabling for TACAN shall be in accordance with SPAWAR 0967-LP-627-3000 Series. The technical requirements for the cable are defined in SPAWAR 0967-LP-627-3000 Series, Chapter 8 - Installation.

3.7.4. **Antenna Housing.**

The Antenna Housing shall provide the mechanical support for all major components of the antenna and shall include the required external interface and the internal cabling between the major components.

3.7.5. **Radome Enclosure.**

The Radome Enclosure shall provide a RF transparent shield for the Antenna.

3.8. **Precedence.**

The requirements of this specification shall pertain in the following order of precedence from highest to lowest:

a. The Specifications for the Terminal Antenna Interface only in the following order:

(1) DCB9S4000; with SCNS 1-8

(2) DCB86S5000; DCB86S5000

b. The Shipboard Terminal Interface Control Document, Y207A135, for the Terminal Antenna Interface only.

c. This Specification

d. Interface Control Drawing for JTIDS Shipboard Antenna, NOSC TD 1283

e. The other specifications referenced herein in the following order:

f. NOSC Plans

g. NOSC Standard Policies and Procedures.

4. QUALITY ASSURANCE PROVISIONS.

4.1. General.

This section specifies the requirements for verification of the design and performance of the antenna. The objective of these verifications are to provide assurance that the requirements and characteristics specified in Section 3 are met by the design and that each of the delivered antennas meet the specified performance and workmanship requirements. The quality assurance provisions shall include the following activities:

a. Special Test and Examinations (ST&E). These shall include:

(1) Materials, parts and processes examinations,

(2) Procurement tests, and

(3) Engineering tests and evaluations

b. Quality Conformance Inspections, consisting of two levels of verification:

(1) Developmental Test and Evaluation (DT&E), and

(2) Acceptance Tests

4.1.1. Responsibility for Tests.

The NOSC shall be responsible for the performance of all tests and examinations herein.

4.1.2. Special tests and examinations.

4.1.2.1. Materials, Parts and Processes Examination.

Inspection, measurement, test or analysis as appropriate shall be conducted to ensure that materials, parts and processes satisfy the requirements specified in 3.3.1.

4.1.2.2. Electrical Connectors.

Electrical connector requirements of 3.3.1.1.1. shall be verified by mechanical and visual inspection.

4.1.2.3. Design Practices.

Design practices requirements shall be verified by mechanical and visual inspection.

4.1.2.4. Procurement Tests.

Receiving inspection tests shall be performed as applicable on major procured items, and contracted elements. These tests shall include, but not necessarily be limited to: visual and mechanical inspections, gross functional tests, and documentation inspections.

4.1.2.5. **Engineering Tests and Evaluations.**

Engineering tests and evaluations shall consist of those tests performed by the NOSC in parallel with the development effort to provide means for early detection and correction of design deficiencies. Except for reliability development, formal approved test plans and procedure are not required. Copies of engineering test data shall be made available to the SPAWAR PMW-159 upon request.

4.1.2.5.1. **Reliability Development Testing.**

MIL-STD-1635 shall be used as a guide for reliability development test plans, procedures and tests.

4.1.2.6. **Thermal Survey.**

MIL-E-16400 shall be used as a guide for the thermal survey, performance evaluation, and reporting procedures.

4.2. **Quality Conformance Inspections.**

The antenna shall be subjected to two levels of verification as part of the Quality Conformance Inspection. Contractor Developmental Test and Evaluation (DT&E) shall verify that the antenna design meets all of the specified performance, environmental, reliability, maintainability, safety, and human factors/human engineering requirements, and shall consist of Preliminary Qualification Tests (PQT's). and Formal Qualification Tests (FQT's). Acceptance tests shall be conducted on each of the antennas to ensure that each antenna meets the specified functional performance and workmanship requirements.

4.2.1. **Verification Methods.**

Compliance with requirements shall be verified by one or more of the following methods:

a. Inspection - Verification by a visual examination of the item, reviewing descriptive documentation, gauging or measurement, and comparing the appropriate characteristics with a predetermined standard to determine conformance to requirements without the use of special laboratory equipment or procedures.

b. Analysis - Verification by technical/mathematical evaluation using mathematical representation (i.e., mathematical models, algorithms, equations) charts, graphs, circuit diagrams, data reduction and/or representative data to show that the requirements have been met.

c. Demonstration - Verification of operation, movement and/or adjustment of the item under a specific condition to perform the design function without recording of quantitative data except for check sheets. The item may be instrumented and quantitative limits of performance monitored but actual data is not required to be recorded.

d. Test - Verification through the systematic exercising of the applicable item under all appropriate conditions with instrumentation and collection/analysis/evaluation of quantitative data.

4.2.2. **Developmental Test and Evaluation (DT&E).**

DT&E shall verify that the antenna design satisfies the performance, environmental, reliability, maintainability, safety, and human factors/human engineering requirements of Section 3. Verification shall be performed in two stages, Preliminary Qualification Tests (PQT's) and Formal Qualification Tests (FQT's).

4.2.2.1. **Preliminary Qualification Tests (PQT).**

The antenna PQT shall be conducted in accordance with test plans and procedures prepared by the NOSC and approved by the SPAWAR-159. The Antenna shall be subjected to PQT in order to verify that the design approach and construction practices will comply with the requirements of Section 3 and to determine the suitability of the equipment for operational testing.

4.2.2.2. **Formal Qualification Tests (FQT).**

The antenna shall be subjected to FQT in order to verify compliance with all requirements of Section 3 and to determine the suitability of the antenna for subsequent equipment production. The tests shall be conducted using test plans and procedures prepared by the NOSC and approved by the SPAWAR PMW-159.

4.2.2.2.1. **Software Formal Qualification Test.**

Not applicable.

4.2.2.2.2. **Functional Performance Tests.**

The antenna shall be subjected to FPT to verify compliance with the functional performance requirements of 3.0. These tests shall be performed on an antenna connected in the normal configuration including the AS-3240/URN Shipboard TACAN Antenna installed in accordance with Interface Control Drawing NOSC TD 1283.

4.2.2.2.3. **Environmental Compliance.**

Analyses and tests shall be performed to verify that the equipment is capable of withstanding and operating under the service and induced conditions specified in 3.2.5.

4.2.2.2.4. **Reliability Test.**

A Test, Analyze, and Fix (TAAF) program shall be conducted in accordance with the detailed requirements of MIL-STD-1635.

4.2.2.2.5. **Maintainability Test.**

The Mean-Corrective-Maintenance-Time and Maximum Corrective-Maintenance-Time as defined in 3.2.4 shall be demonstrated in accordance with MIL-STD-471, Test Method 9.

4.2.3. **Acceptance Tests.**

Each Antenna to be delivered shall be subjected to acceptance tests to ensure that meets the specified functional performance, materials, processes, and workmanship requirements. Acceptance tests shall consist of mechanical/visual inspections, vibration and temperature screening (Figures 4.1 and 4.2), and other specified performance tests. The tests shall be conducted using test plans and procedures prepared by the NOSC and approved by the PMW-159.

4.2.3.1. **Inspections.**

Each antenna shall be subjected to the in-process inspections and tests necessary to verify that the quality of all materials, processes and workmanship are in compliance with the requirements of this specification as well as the individual drawings, specifications, standards, etc., for the antenna. Attention will be given, but not limited to the following:

a. Completeness
b. Nameplates, identification marking and labels
c. Finishes
d. Welded and solder joints
e. Fit of components
f. Mounting means
g. Safety features
h. Fastening and securing devices and parts
i. Cable runs between components including plugs and receptacles
j. Grounding connections
k. Weight
l. Overall dimensions
m. Potential shorts and defective insulation
n. Foreign objects, lint, dust
o. Other visual defects

4.2.3.2. **Screening.**

4.2.3.2.1. **Vibration Screen.**

Prior to temperature cycling, the antenna shall be subjected to a vibration screen.

a. The vibration shall be random or, subject to SPAWAR PMW-159 approval, pseudorandom or complex waveform vibration, for an accumulated period of ten minutes. The antenna shall be vibrated in the horizontal axis. The antenna shall be hard mounted (without shock isolators) and subjected to the vibration conditions of Figure 4.1. The control accelerometer shall be located next to one of the mounting points of the antenna. (Equipment having a bandwidth no greater than 10 Hz for vibration frequencies up to 500 Hz and 100 Hz for vibration frequencies above 500 Hz shall be used for the control and analysis of the acceleration spectral density (ASD).)

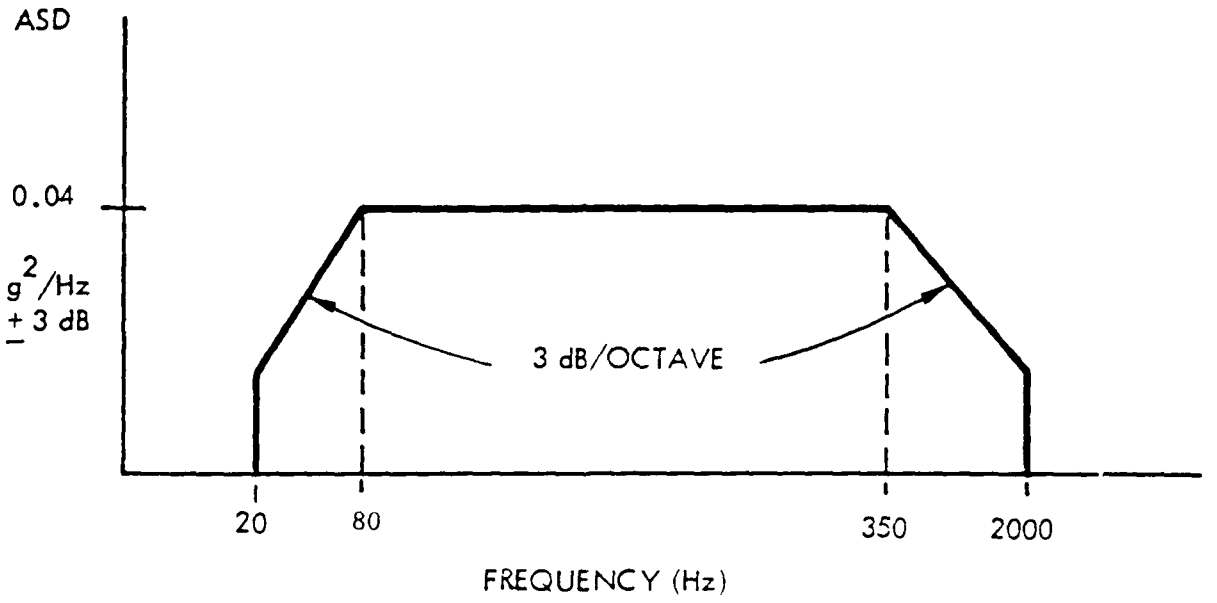

Figure 4.1 - Random Vibration Cycle

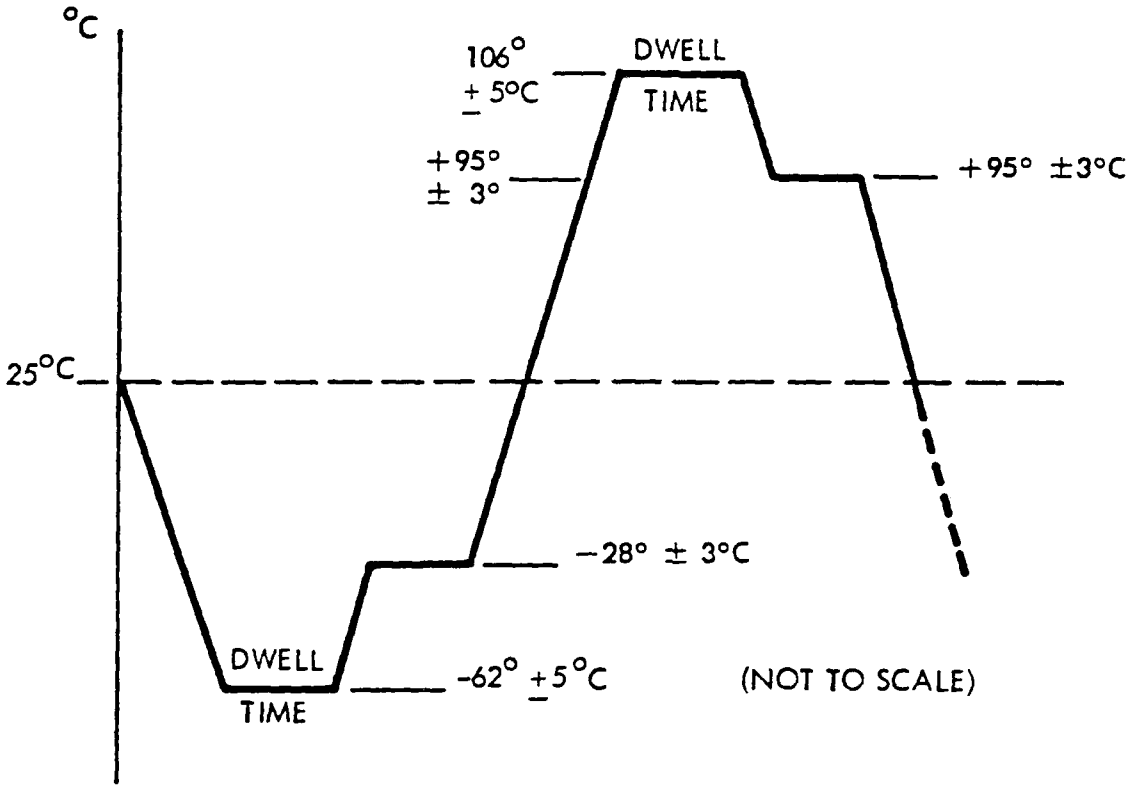

Figure 4.2 - One Cycle of Temperature Curve

b. All malfunctions occurring during test shall be corrected and the test resumed.

4.2.3.2.2. **Temperature Cycling.**

The antenna shall be subjected to 10 cycles of the temperature curve indicated in Figure 4.2. The temperature rate of change shall not be less than 5 centigrade degrees per minute.

The dwell time shall be 80 percent of the time required for the largest electrical or electronic part to become temperature stabilized. Temperature stabilization shall be as defined in MIL-STD-810 for the non-operating condition. When failures occur, the equipment shall be reworked and the cycling continued for a minimum of 10 cycles, error free.

4.2.3.3. **Acceptance Performance Test.**

After completion of the screening tests, each antenna shall be subjected to an Acceptance Performance Test to verify compliance with the functional and performance requirements of 3.0. The tests shall exercise all critical functions of the antenna. A complete visual inspection for completeness, potential failure, damage, and loose particles shall follow completion of acceptance tests.

4.2.4. **Verification Cross Reference Index (VCRI).**

Table 4.1 provides the VCRI. The I, A, D, T codes refer to Inspection (I), Analysis (A), Demonstration (D) and Test (T) as defined in 4.2.1.

Table 4.1 Verification Cross Reference Index (VCRI)

SECTION 3 REFERENCE	TITLE	I	A	D	T	REMARKS
3.0	REQUIREMENTS					N/A
3.1	Item Definition	N/A				
3.1.1	Item Diagram	N/A				
3.1.2	Interface Definition	N/A				
3.1.3	Major Component List	N/A				
3.1.4	Government Furnished Property List					N/A
3.1.5	Government Loaned Property List	N/A				
3.2	Characteristics					N/A
3.2.1	Performance Characteristics					N/A
3.2.1.1	Frequency Range				T	
3.2.1.2	Polarization				T	
3.2.1.3	Radiation Pattern and Gain				T	
3.2.1.4	Overhead Coverage				T	
3.2.1.5	Ports				T	
3.2.1.6	Characteristic Impedance				T	
3.2.1.7	Voltage Standing Wave Ratio (VSWR)				T	
3.2.1.8	Isolation				T	

Note: "IADT" Column on the Verification Cross Reference Index represents the verification method and is indicated by the following codes:

I - Inspection
A - Analysis
D - Demonstration
T - Test

Table 4.1 Verification Cross Reference Index (VCRI) (Continued)

SECTION 3 REFERENCE	TITLE	I	A	D	T	REMARKS
3.2.1.9	RF Power Capability				T	
3.2.1.10	Corona			D		
3.2.1.11	Intermodulation Products				T	
3.2.1.12	Lightning Protection	I				
3.2.1.13	Insersion Loss				T	
3.2.2	Physical Characteristics	I				
3.2.2.1	Paint	I				
3.2.2.2	Mounting	I				
3.2.2.3	Size	I				
3.2.2.4	Weight				T	
3.2.2.5	Pressure Relief	I				
3.2.2.6	Sealing				T	
3.2.3	Reliability		A			
3.2.4	Maintainability		A	D		
3.2.5	Environmental Conditions		N/A			
3.2.5.1	Service Conditions					N/A
3.2.5.1a	Equipment Exposed to Weather (Unsheltered)				T	
3.2.5.1b	Equipment Utilized in Sheltered Area					N/A
3.2.5.1c	Non-Operating Temperature Ranges				T	
3.2.5.1d	Humidity, Moisture and Rain				T	
3.2.5.1e	Fungus				T	
3.2.5.1f	Salt Atmosphere				T	
3.2.5.1g	Wind Velocity		A			
3.2.5.1h	Icing		A			

Table 4.1 Verification Cross Reference Index (VCRI) (Continued)

SECTION 3 REFERENCE	TITLE	I	A	D	T	REMARKS
3.2.5.1i	Pressurization	I				
3.2.5.1j	Solar Radiation		A			
3.2.5.1k	Lightning		A			
3.2.5.1l	Inclination Magnetic Field Environment		A			
3.2.5.2	Induced Environmental Conditions		N/A			
3.2.5.2.1	Vibration					N/A
3.2.5.2.1.1	Operating Vibration				T	
3.2.5.2.1.2	Non-Operating Vibration		A			
3.2.5.2.2	Shock					N/A
3.2.5.2.2.1	Operational Shock				T	
3.2.5.2.2.2	Transportation Shock				T	
3.2.6	Transportability	I				
3.2.7	Nuclear Control Requirements		A			
3.3	Design and Construction	I				
3.3.1	Materials, Parts and Processes	I				
3.3.1.1	Parts	I				
3.3.1.1.1	Electrical Connectors	I				
3.3.1.2	Materials					N/A
3.3.1.2.1	Moisture and Fungus Resistance	I			T	
3.3.1.2.2	Corrosion	I			T	
3.3.1.3	Design Practices					N/A
3.3.1.3.1	Reliability Design Requirements		A			

Table 4.1 Verification Cross Reference Index (VCRI) (Continued)

SECTION 3 REFERENCE	TITLE	I	A	D	T	REMARKS
3.3.1.3.1.1	Reliability Program	I				
3.3.1.3.1.2	Reliability Predictions	I				
3.3.1.3.1.3	Development Testing	I				
3.3.1.3.1.4	Detailed Reliability Design Practices	I	A			
3.3.1.3.2	Maintainability Design Requirements	I				
3.3.2	Electromagnetic Interference (EMI)/TEMPEST					N/A
3.3.3	Nameplates and Product Marking					N/A
3.3.3.1	General	I				
3.3.3.2	Detail Requirements					N/A
3.3.3.2.1	Nameplate	I				
3.3.3.2.2	Location	I				
3.3.3.2.3	Attachment	I				
3.3.3.2.4	Size	I				
3.3.3.2.5	Part Markings	I				
3.3.3.2.6	Conductor Identification	I				
3.3.3.2.7	Terminal End Identification	I				
3.3.3.2.8	Weight, Dimension, and Center of Gravity Data	I				
3.3.4	Workmanship	I				
3.3.5	Interchangeability	I				
3.3.6	Safety	I				

Table 4.1 Verification Cross Reference Index (VCRI) (Continued)

SECTION 3 REFERENCE	TITLE	I	A	D	T	REMARKS
3.3.6.1	System Safety Program	I				
3.3.6.2	Safety Criteria	I	A			
3.3.6.3	Personnel Hazards	I	A			
3.3.7	Human Performance/Human Engineering	I		D		
3.4	Documentation	I				
3.5	Logistics					N/A
3.5.1	Maintenance				N/A	
3.5.1.1	Concept					N/A
3.5.1.1.1	Organizational Level Maintenance			D		
3.5.1.1.2	Intermediate-Level Maintenance			D		
3.5.1.1.3	Depot-Level Maintenance			D		
3.5.1.2.	Maintenance Task Descriptions				N/A	
3.5.1.3	Technical Data			D		
3.5.2	Supply	I				
3.5.3	Facilities and Facility Equipment	I				
3.5.4	Support Equipment	I		D		
3.6	Personnel and Training					N/A
3.6.1	Personnel			D		
3.6.1.1	Operation					N/A
3.6.1.2	Maintenance			D		
3.6.2	Training			D		

Table 4.1 Verification Cross Reference Index (VCRI) (Continued)

SECTION 3 REFERENCE	TITLE	I A D T	REMARKS
3.7	Major Component Characteristics		N/A
3.7.1	Bicone Array Assembly Containing		N/A
3.7.2	12 Probes 12-Way Power Divider/Combiner		N/A
3.7.3	Transmission/Signal Cabling for TACAN		N/A
3.7.4	Antena Housing		N/A
3.7.5	Radome Enclosure		N/A
3.8	Precedence		N/A

5. PREPARATION FOR DELIVERY.

All items shall be delivered in accordance with the appropriate preservation packaging, packing and marking, such that adequate protection is provided against corrosion, deterioration and physical damage during shipment and handling. Preservation packaging and packing shall be as specified for Level A in accordance with MIL-STD-794. Marking of all shipments shall be in accordance with MIL-STD-129.

6. NOTES.

6.1. Definitions.

6.1.1. Maintainability.

6.1.1.1. Mean-Corrective-Maintenance-Time (M_{ct}).

M_{ct} is defined as follows:

$$M_{ct} = \frac{\sum_{i=1}^{N} \lambda i \; R_{ti}}{\sum_{i=1}^{N} \lambda i}$$

Where:

R_{ti} = time-to-repair each failure or time during which corrective maintenance actions are performed to repair a relevant failure.

i = relevant failure rate of each item of equipment.

N = number of equipment items.

6.1.1.2. Maximum-Corrective-Maintenance-Time.

See paragraph 3.2.4.

6.2. Acronyms and Abbreviations.

Analysis	A
Acceptable Performance Level	APL
Acceleration Spectral Density	ASD
Built-In-Test	BIT
British Thermal Units	BTU
Contractor Developmental Test and Evaluation	CDT&E
Demonstration	D
Decibel	dB
Decibel above an isotropic source	dBi
Defense Logistics Supply Center	DLSC
Electromagnetic Interface	EMI
Formal Qualification Tests	FQT
Full Scale Development	FSD
Government Furnished Equipment	GFE
Inspection	I
Joint Tactical Information Distribution Systems	JTIDS
Maximum-Corrective-Maintenance-Time	Mmaxct
Mean-Corrective-Maintenance-Time	Mct
Mean-Time-Between-Failures	MTBF
Naval Ocean Systems Center	NOSC
Non-Relevant Failures	NRF
National Stock Number	NSN
Prelilimary Qualification Test	PQT
Printed Wiring Boards	PWB
Time-to-Repair	RT
Radio Frequency	RF
Relevant Failure	RF
Ready for Issue	RFI
Radioman	RM
Support Equipment Recommendation Documentation	SERD
Space and Naval Warfare Command	SPAWAR
System Relevant Failures	SRF's
System Safety Program Plan	SSPP
Special Test and Examinations	ST&E
Test	T
Test Analyze, and Fix	TAAF

Tactical Air Navigation	TACAN
Verification Cross Reference Index	VCRI
Voltage Standing Wave Ratio	VSWR